

## Preparation of Proton Conducting Anhydrous Membranes Using Poly(vinyl chloride) Comb-like Copolymer

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A comb-like copolymer consisting of a poly(vinyl chloride) backbone and poly(hydroxy ethyl acrylate) side chains, i.e. PVC-g-PHEA, was synthesized through atom transfer radical polymerization (ATRP). This comb-like copolymer was crosslinked with 4,5-imidazole dicarboxylic acid (IDA) via the esterification of the -OH groups of PHEA in the graft copolymer and the -COOH groups of IDA. Upon doping with phosphoric acid (PA, H<sub>3</sub>PO<sub>4</sub>) to form imidazole-PA complexes, the proton conductivity of the membranes continuously increased with increasing PA content. A maximum proton conductivity of 0.011 S/cm was achieved at 100°C under anhydrous conditions. The PVC-g-PHEA / IDA / PA complex membranes exhibited good mechanical properties, i.e. 575 MPa of Young's modulus, as determined by a universal testing machine (UTM). Thermal gravimetric analysis (TGA) shows that the membranes were thermally stable up to 200°C.